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A Catalogue of Mayan glyphs: A Study in information design

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MFA THESIS REPORT

TIMOTHY J WOOD

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A thesis submitted to the faculty of the College of Imaging Arts and Sciences in candidacy for the degree of Master of Fine Arts

COMPUTER GRAPHICS DESIGN
ROCHESTER INSTITUTE OF TECHNOLOGY
ROCHESTER, NEW YORK
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introduction

Information design as a discipline of study is becoming more and more important in our society. The foundations of our contemporary culture are based upon the exchange, collection and consumption of information on a massive scale. Designers, by visualizing and arranging information structures, facilitate the assimilation and navigation of information.

The discipline of information design has been discovered by a new generation of graphic designers. These designers have found themselves poised to be key in the creation and development of complex forms of media created by the emergence of new technologies. This includes interactive multimedia as enabled by the presence of high-powered personal computers. As information sources are becoming richer and delivery systems becoming more complex, the graphic designer/new media developer has become synonymous with information designer.

Throughout history the graphic designer has always adapted to technologies and tools that facilitate the communication of ideas through graphic form. This can be seen by tracing the history of graphic communication through the reed pens & papyrus of ancient Egypt to the illuminated manuscripts of the Benedictine monks. From the invention of moveable type and the printing press, to the mechanization of the printing process, we have now advanced even further to desktop publishing and pure digital

forms of delivery which go beyond linear text and static images. The graphic designer or the equivalent has been a part of each paradigm shift.

This project will address the problem of information design as it is applied to interactive multimedia. The production of this project will form a basis of applied research in which the information at hand will be organized into a coherent and navigable structure. Parallel to this process a working production model will be researched and utilized in a manner appropriate to the project.

Finding a topic or source of information to use as a starting point for this project proved to be difficult. Subject matter was needed that would lend itself to the graphical nature of the media, where its visual aspects would play more than a subordinate role in the communication of what the information was about. Ideally this information would be some kind of graphic form that could be enhanced in an interactive presentation. Also, if this topic already contained some inherent informational relationships then one could easily extract a logical structure.

A prior interest in paleography and archeology led to something that could possibly involve the ancient Mayan Culture. Many aspects of their culture are incredibly interesting and would have a great deal of potential as the focus of some kind of interactive project. These aspects included the Mayan study of astronomy and astrology, their system of mathematics and finally their written system of communication. Amazingly, their system of hieroglyphic writing as a topic met all the criteria for this project. It is an ideal source of information to be organized.

With what I had learned about the Mayan writing system I decided that my project would be concerned with presenting a visual and phonetic guide to Mayan Hieroglyphs in an interactive, non-linear structure. It was also imperative that in this project the nature and cultural context of the information should not only determine the look and feel of the interface, but somehow affect the structure or navigation of the information.

Since the scope of Mayan Hieroglyphics is so immense, this catalogue, a study in information design, deals with only one aspect of the complex written language of the ancient Mayan civilization. The written Mayan language is composed of glyphs that are both logographic and phonetic, which means that a glyph may represent an entire word or only a specific syllable respectively. The glyphs that I chose to deal with are the syllabic or phonetic glyphs. These glyphs have been organized in three different ways.

1. Alphabetically - by sound
2. By the actual image of the glyph
3. By G-number - a numerical cataloging system

This information, in turn, has been organized into interactive modules that reflect each one of the modes of organization. These modules then behave differently depending on the context of the information. The purpose of this is to let the organization of the information drive and define the user's interaction and experience.

literature review

Before the production or design of this project had begun research was done in the areas of graphic design, information design and production design for interactive media. Further research was gathered to provide a basic understanding of the ancient Mayan culture. Data specifically referring to the value and meaning of the mayan glyphs was also needed. The review of literature that follows highlights the volumes that had the most impact and relevance to my work. A complete list of all reference materials used in the design and production of A Catalogue of Mayan Glyphs is listed at the end of this report in the bibliography.

The first book reviewed, Eric Thompson's *A Catalog of Maya Hieroglyphics* is important because it was probably the driving factor behind this project. It was almost completely useless as a reference or guide to Mayan glyphs. However this is not the fault of the author. At the time this book was written much of the details of Mayan culture were still a complete mystery to archeologists, especially the written language. Therefore Thompson's source of data was extremely limited. The only thing Thompson could do was to document the location of glyphs and catalog their visual characteristics.

Since Thompson's catalog only documents the visual aspects of the glyphs, using this book to find a specific glyph is a nightmare. You have to thumb

through the book very meticulously because there are only three or four glyphs per page. You can also refer to a visual index in the back where the glyphs are listed numerically, but this index does not reference the page numbers where the glyphs are detailed. Thompson's cataloging system is also unique to his own work and it does not correlate directly to the other major cataloging systems at the time. In fact, he has to provide a cross reference to the Zimmerman (a contemporary of his) cataloging system in the rear of the book. So you are presented with a system of glyphs with no way to efficiently access or cross reference the information.

Frustration with Thompson's work led to a search for a more complete and up to date source of information. I discovered that since the time Thompson's book was published most of the glyphs have been decoded. Work is now being done to translate and publish the body of Mayan literary work that has been uncovered over time. Online databases are being established to assist archeologists and linguists in this task. The most significant online resource is the Mayan Epigraphic Database Project. Though this database provided the model upon which A Catalogue of Mayan Glyphs' information structure was built, the navigation and overall usability of this site was less than ideal. (Since production was completed, new search and catalog functionality have been added to this site which have addressed some of the usability issues.)

Edward R Tufte's *Envisioning Information* is internationally known as being one of the seminal volumes in the history of information design. In the introduction to his book Tufte states, "The world is complex, dynamic, multidimensional; the paper is static, flat. How are we to represent the rich visual world of experience and measurement on mere flatland?" This quote is applicable to media beyond the sheet of paper. This same dilem-

ma exists as it is applied to the computer monitor or the video screen.

Tufte breaks his book up into six sections, *Escaping Flatland, Macro / Micro Readings, Layering and Separation, Small Multiples, Color* and *Information, Narratives of Space Time* and the Epilogue.

In *Escaping Flatland* Tufte establishes the fact that the communication (synergy) between the reader of an image and the creator of that image presently takes place on a two dimensional surface. (p12) The goal of this chapter is to outline some of the design strategies that can increase the information resolution and resolving power of paper and video screen (p13) thereby enhancing communication to the user.

The chapter *Macro / Micro Readings* is a celebration of the human ability to perceive fine detail. Tufte's objective in this chapter is to illustrate the fact that information design isn't necessarily about the simplification of data to ease communication. "Visual displays rich with data are not only an appropriate and proper compliment to human capabilities, but also such designs are frequently optimal." (p50) This idea will become increasingly important during the design stage in the production of A Catalogue of Mayan Glyphs.

Another key chapter, *Layering and Separation* is concerned with the emergent effects of juxtaposed forms, positive and negative. Tufte likens this to Joseph Albers' *1+1=3 or more* principle, which is another way of stating *thesis+antithesis=synthesis.* The key is to avoid confusion in the reading of layered information. Small distinctions between visual datatypes result in more effective interpretation at the macro level. (p65)

Small Multiples addresses the evaluation of data by the occurrence of a large number of "small multiple" designs. This technique emphasizes a visual comparison based upon the variations in the small multiple forms. Frequency and quantity of the designs depends on the type of information you are presenting and how much clarity is needed. (p67)

Color and Information starts by reiterating part of Swiss cartographer Eduard Imhoff's *Cartographic Relief Presentation.* Imhoff states in his first rule that "Pure, bright or very strong colors have loud unbearable effects when they stand unrelieved over large areas adjacent to each other, but extraordinary effects can be achieved when they are used sparingly on or between dull background tones." Much of Tufte's rationale for the use of color often refers to these cartographic techniques. In addition, Tufte illustrates the use of color as form in the absence of linear information with the work of Oliver Byrne and the diagrams he used in *The Elements of Euclid.*

The final chapter, *Narrative of Space and Time* is particularly fascinating due to its relevance to the design of interactive multimedia. Time-based media has the ability to accurately represent cause/effect relationships and time-based information structures. This becomes most apparent at the end of this chapter when Tufte notes that narrative information is the most difficult to represent as static image on a two-dimensional surface.

Tufte's ideal design would be the most logical and precise presentation of information in its most elegant form. Tufte, in his book Visual Explanations states, "...clarity and excellence in thinking is very much like clarity and excellence in the display of data. When principles of design replicate principles of thought, the act of arranging information

becomes an act of insight." (p9) These ideas are elemental to understanding Tufte's design rationale.

A few discrepancies became apparent through the course of studying this book. Tufte is strictly concerned with the presentation of information on paper. He makes little attempt to transpose his ideas into the time-based media of film, video, and interactive multimedia. What mention he does make to computers is often derogatory or virtually ignorant. In his commentary concerning a poorly designed chart he ends his critique by saying, "who would trust a chart that looks like a video game?" However, this book was extremely valuable in demonstrating how dependent the interpretation of information was to its actual visual presentation. The presentation itself could reveal higher levels of data that might not be apparent when the data is in a less visually organized state.

The book *Designing Business: Multiple Media, Multiple Disciplines* by Clement Mok deals with the issue of design of traditional and new media on many levels. Each chapter of the book is an attempt to enlighten the reader to the many levels of production that they may be unfamiliar with. It also shows how a specific discipline of design may be related to, or dependent on another discipline. The chapters are: *Designing Business, Multiple Media, Multiple Disciplines, Identity Design, Information Design* and *Interactivity Design.* A final chapter called *Integrated Views: Case Studies* is dedicated to illustrate many of the conclusions reached in the previous chapters.

The first chapter, *Designing Business*, starts off "Everything is Designed" where Mok explains that good design affects us in very real ways, whether we're aware of it or not. (p4) Good design can manifest itself in

Information Architecture

The assembly of the collective whole, or the integration of technological applications.

Information Design

The organization of the products of information arts, or the arrangement of information structures.

Information Arts

The thoughtful arrangement of data.

from Designing Business by Clement Mok

the highway signage we see everyday, or within the code that drives the software we use on our computers. Some of this design is readily apparent, some is not. Mok then begins to focus on the role of the designer in the digital era. He states, "The biggest challenge designers face in working with the computing medium is not in mastering the various technologies that are its constant companions, but in introducing meaning and life into the products and services on the human side of the screen." (p4)

Multiple Media | Multiple Disciplines immediately addresses the importance of print media in the history and advancement of civilization. Mok works sequentially through the emergence of the other major forms of media, mainly broadcast and interactive media. He explains how each is relevant to other and how they have affected the growth of our society. Towards the end Mok introduces his DADI design process, an acronym for Definition, Architecture, Design, and Implementation (detailed later in this report).

Identity Design deals with the relevance of identity systems within different contexts. Each context has the potential to possess attributes which may render an identity system obsolete. An example of this may be the new networked global economy, where certain cultural cues valid in North America become invalid when viewed from the perspective of a Southeast Asian. Mok continues throughout this chapter providing examples of where identify is important and where it isn't.

The fourth chapter, *Information Design,* starts by dissecting information design into three interrelated disciplines. These disciplines have a hierarchical relationship to each other. On the highest level is information architecture which Mok defines as "the assembly of the collective whole,

or the integration of technological applications." On the middle level is information design, which he defines as "The organization of the products of information arts, or the arrangement of information structures." On the lowest level are the information arts, defined as "the thoughtful arrangement of data." It is through this structure that the designer is able to map a complex system and bring order to the information.

The Chapter *Interactivity Design* starts by differentiating interactive design from information design by the fact that interactivity manifests itself as a display of action, by definition. Interactivity in general can be dissected into three hierarchical disciplines. At the top level is interactivity art, which makes a broad analysis of the media it's going to be applied to. Below that level is interactivity design, which focuses on the inner workings of the application and how that is presented to the user via the third level, interface design.

Integrated Views: Cases Studies examines all the topics mentioned in the above chapters as they have been applied to real world client based scenarios. Throughout the scenarios it becomes apparent that each individual case presents unique problems that require unique solutions. The lesson of this chapter is that many of the processes Mok establishes throughout the course of his book need to evolve to suit the needs of the individual client on a project by project basis. This is essential to creating a successful product.

Much of the ides discussed in this book were integral to the production of A Catalogue of Mayan Glyphs. The entire DADI process worked well, though it had to be altered to accommodate a production team consisting of one person. Mok's clear and direct language made complex ideas easy

to understand. The entire book is thick with detailed and communicative diagrams that would be the envy of Tufte. This book is full of solutions to problems encountered everyday in contemporary design studios and new media agencies and is an excellent resource for a student in our field. It could even be an excellent textbook.

Aaron Marcus's *Graphic Design for Electronic Documents and User Interfaces* was another excellent resource. From Mok's hierarchical perspective it deals primarily with direct user interaction - right at the screen level. This book describes systems for organizing information on the screen for optimal user interaction.

One of the most relevant chapters is *Layout.* It cover the topics *Proportions and Grids* as well as *Graphic Design of Spatial Metaphors.* The first part of the chapter explains how informational relationships can be established or enhanced within a grid hierarchy. The second part of the chapter takes much of the same theories but extends them into the third dimension. Marcus shows that even though the screen display is two dimensional there are visual cues and that can simulate the effects of depth.

Typography covers the issues related to the arrangement of typographic forms on the screen. Marcus focuses specifically on legibility and readability. Marcus differentiates the two concepts by stating "Legibility concerns the readers ability to successfully find, identify, discriminate, and absorb the text. Readability concerns the ease of interpretation and the text's appeal." (P31) These concepts are at the core of Marcus's screen typography. Marcus concludes this section by emphasizing the importance of typographic awareness in creation of effective visual communication.

The chapter *Color* provides some of the most important information towards effective visual communication. Marcus starts the chapter with this powerful statement:

"Color is the most sophisticated and complex of the visible language components. We react strongly to color in the natural environment, in graphic communication, and in industrial design. As color hardcopy devices and color display screens proliferate, a skilled, professional use of color must accompany all communication." (p77)

Much of this chapter is concerned with introducing the basics of color to the reader. Marcus then explains the power of color to communicate by giving examples of what it can do, for example, "Call attention to specific data..." or "Identify elements of structures and processes." (p80) He also provides examples of color's negative effects. "May cause visual fatigue and after images induced by strong colors" or "May cause visual confusion due to complexity and potency of color phenomenon." (p80) At the end of the chapter is 'Ten Commandments' for the use of color, which is a set of guidelines a designer can follow for the most effective use of color.

Graphic Design for Electronic Documents and User Interfaces provided much of the rationale for the mapping of controls and informational areas in A Catalogue of Mayan Glyphs. It became obvious that rational, consistent and precisely structured information layouts are the only assurance you have that your intended user will be able to successfully navigate the information that you have presented on the screen. Marcus's book proved to be an excellent reference for the final design.

procedure

The approach to production in A Catalogue of Maya Glyphs is based upon Clement Mok's production team oriented DADI design system. Some early considerations had to be made up front to adapt the DADI process to this project. A Catalogue of Maya Glyphs was unique in many respects. The production team was comprised of a single person, there were no specific budget constraints and the actual production time frame was limited to not much more than eight weeks. From the process point of view many aspects of this project were wide open and had much potential but this was countered by the discrepancies and restrictions in the production team and timeline.

definition

architecture

design

implementation

Definition Stage: The first stage of the process involves the definition of the project. Ideally this is where a production team would gather together all the information concerning functional requirements, creative concepts, budgeting and time frame. This then provides a comprehensive idea of the scope of the project.

The purpose of this project was to create a prototype of a system that would present a visual and phonetic guide to Mayan Hieroglyphs in an interactive, non-linear structure. This included a need to have all data concerning a specific glyph simultaneously present independent of the users search context. For example, if the user were attempting only a visual

identification of a glyph they would also be presented with all other relevant data for that individual glyph. To effectively model the informational relationships of the glyphs a maximum of forty out of the potential fifteen hundred glyphs were to be used. This would provide enough data for the prototype to model an appropriate and scalable solution within the time and production constraints. Beyond the purely informational value of this project there was a need to somehow communicate the breath and depth of the ancient Mayan culture. The objective here was to offer the user some kind of context for these glyphs that might positively affect the users perception and experience while using this tool. With these requirements clear the scope of this project could be established.

Architecture Stage: This stage is concerned with defining key informational types and understanding their relationships. These relationships should become the foundation upon which the final structure should be based. Once the structure is defined, then establishing a navigational model becomes very easy.

The Mayan Epigraphic Database Project defines three basic information types for phonetic glyphs. They are "p-value", which refers to the glyphs phonetic value (the audible sound when vocalized, as opposed to semantic value), the glyph's visual reference (what it looks like), and it's g-number, a serial number-like system used to designate specific glyphs. All of this data may be of use depending on the needs of the user.

After analyzing the organizational structure within the Mayan Epigraphic Database Project it seemed important that the three main datatypes be viewed or searched independently, but at the same time it was important that the user be aware of the other correlating information types existing

in the other two fields. This defined three chunks of independent but related data that would be the foundation for the information architecture, a glyph image node, a g-number node, and a p-value node.

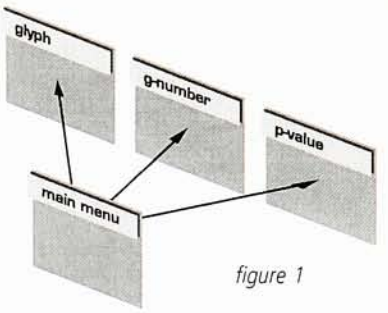

figure 1

Navigation between those three nodes could be accomplished many ways. The original idea was to create an upper level directory that would point to each of the three nodes *(figure 1)*. The next iteration included an upper-level directory as well as internodal navigation so the user wouldn't be forced to back out to the directory level in order to navigate to another node *(figure 2)*. The next logical conclusion was to eliminate directory level navigation altogether because the user had access to all the other nodes within each individual node anyway *(figure 3)*. The implementation of the project would have to account for this direct means of navigation and arrive at a solution that gave the user a sense of "home" while being shifted into different information spaces to avoid any disorientation.

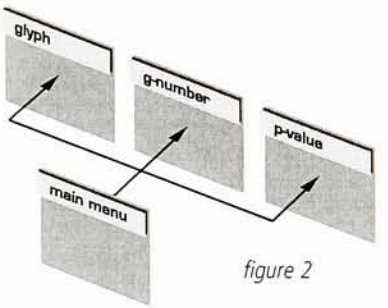

figure 2

To potentially extend the architecture to encompass the full fifteen hundred glyphs, each node of information would have to be expanded along the z-axis relative to the users primary experience. It is very important that any additional information will always expand the information space perpendicular to the primary screen. This will maintain the user centric orientation. Any expansion would happen sequentially across multiple screens depending on the mode of organization *(figure 4)*. Each of the screens within the node would reflect that node's primary interface. In order to mirror the higher level organization of the catalogue, any internodal navigation would have to occur without any overt high level directory screens. This could be accomplished by the addition of navigational control within the context of the main interaction area. For example, a system of buttons defining linear and random navigation would be displayed consistently

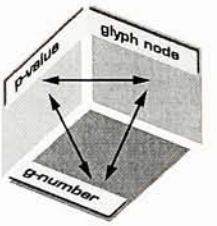

figure 3

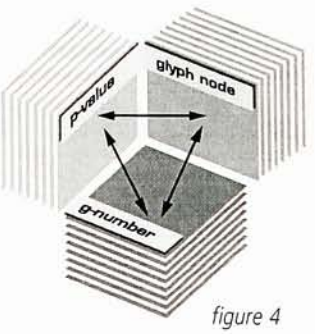

figure 4

within that node. Feedback pertaining to the users relative position within that space wound be registered in the information display area. This display in conjunction with the node indication in the navigation and function area would provide the global and local orientation for the user.

With this level of the architecture established it became necessary to conceptualize how this would be applied to a technology platform. The authoring software of choice was Macromedia Director v5.0 due to its flexibility and strong support of rich media types. This software package would allow for the creation of three separate application modules that reflect the information architecture at a functional level. Within the modules common interface elements, visual cues and stylistic execution in screen design would be key factors in maintaining a sense of continuity while moving between the different modules.

Design Stage: At this stage the creative development of the project is worked through and finalized. This includes interface mapping , user experience concepts and screen designs. Then the final screens should be generated in an appropriate manner for the production platform (ready for breakdown). Almost all of the production artwork should be finished by the end of this stage, but it may be necessary to hold off on final graphics preparation (actual breakdown) until more details are known about the implementation.

Before work was started on anything else, it was important to take all the information concerning basic functional requirements and navigational requirements and attempt to map those to a screen design. These basic screen designs will form a template for a common, consistent interface across the three modules. In many ways this interface is independent of

the main user experience, yet all the data that results from user interaction is displayed here. Some of the final solutions are shown here.

The rationale for the final design is as follows:

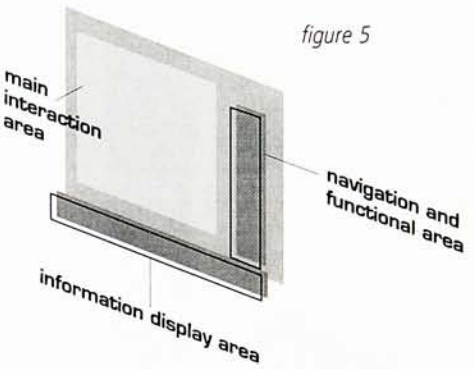

figure 5

The large rectangular space dominating the screen is reserved for the main interaction area for each module. The actual content of this area will depend on the module's context and final design. Its placement abuts it to the upper left-hand corner of the screen in accordance with the hierarchy of western visible language (where one starts from the upper left and works toward the lower right - as in printed text). This placement along with its large size establishes this area as the most important on the screen, the place where primary interaction is to occur.

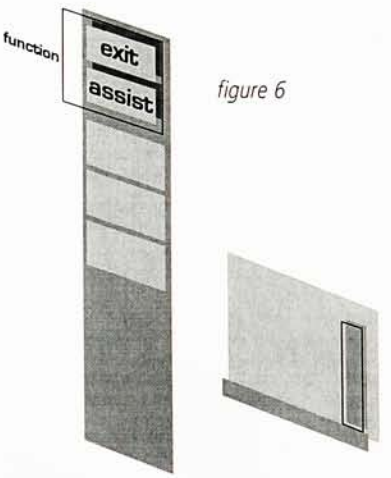

figure 6

Bordering the right-hand side of the screen is a vertical column containing the three navigational controls and two main application functions. These elements have been grouped hierarchically towards the top of the screen. Their order and placement is a direct result of their functionality. At the top is the exit button *(figure 6)*. Conceptually this button is the most "dangerous," it's functionality enables the user to either restart, quit or view the credits screen. All of these actions more or less disable the true function of the application, so it was important to place this button where it could not be activated indeliberately. Putting it at the top of this column keeps at the furthest distance possible from the main interaction area, therefore less likely to be accidentally clicked. The next item directly below the exit button is the assist button. When activated the assist button enables multiple functionality similar to the exit button. Its functionality includes access to help, a map screen, appendices and a sound control but these are not as disruptive to the application as the exit button so it is

positioned in the second tier. Both of these buttons will activate and de-activate animated menus that list and provide their multiple functions. Their function will be reflected not only in their grouping on the screen but also by their color and the manner in which they are rendered. On activation their menus appear in a "multipurpose zone" below the navigational controls.

The sub-grouping below those two buttons is concerned with navigation *(figure 7)*. These are still secondary to the main functionality of the application (what occurs in the main interaction area) but they likely to be used more often than exit or assist. They reside lower in the column closer to the main interaction and within an easy click for the user. The vertical order of the navigational buttons is more or less arbitrary. Each of the three nodes is of equal importance, therefore it is important that their final visual treatment is similar. It is the user who will define which module will provide the proper context for their search. The key to identifying their differentiation in navigation will be by their differentiation in color.

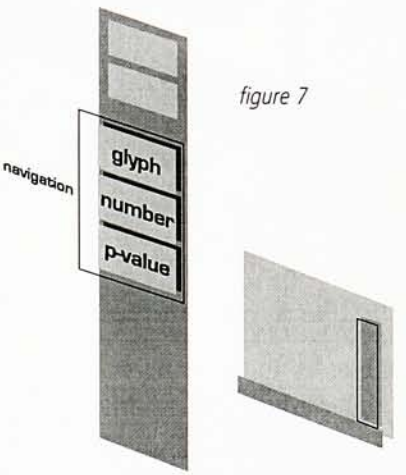

figure 7

Along the bottom of the screen is an area dedicated to the display of all glyph related information. This area has essentially been divided into three parts, with each part corresponding to an aspect of the data. For example, there is an area to display the g-number, the p-value, and the glyph image. These displays enable to user to view all aspects of the data simultaneously throughout the three modules independent of any search context. This function optimizes the user's search by eliminating any unnecessary navigation to the other modules.

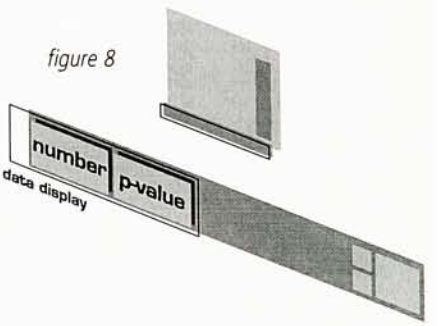

figure 8

Grouped to the left of the screen, are the g-number and p-value displays *(figure 8)*. These displays are passive and have no inherent interaction capabilities, they needed their own defined area away from the vertical

column of interactive items. The horizontal position of these displays was arbitrary because, as before, it is the user's search context that defines the area he/she focuses on.

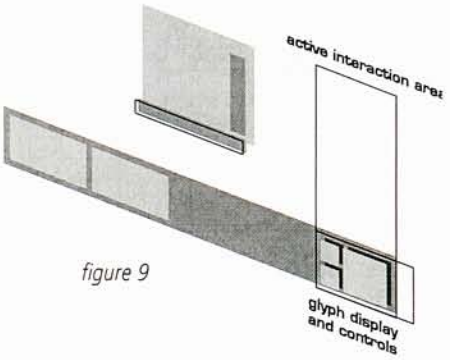

figure 9

On the left of this horizontal bar is an area shared with the vertical column *(figure 9)*. This area has been designated as a display for the actual glyph image. Directly associated with this are two buttons used to view numerically adjacent glyphs. This display resides not only in the horizontal information area but also intersects the vertical interactive area because it shares the characteristics of both screen elements. It can be a purely passive information display or can be used actively to view other glyphs. At all times the data displays on the left correlate to the glyph shown in that area.

Each module (mainly that content which is independent of the outer interface elements) utilizes a unique interface that reflects the nature of the data it represents. The focus of the p-value module is a ring of phonemes surrounding a large, central glyph display. The glyph display is activated when the user rolls his/her cursor over a specific phoneme. The phoneme will flash to a highlighted state to indicate that it is active while the cursor maintains its position. If the glyph flashes green, it indicates that there are multiple glyphs for that specific phoneme. The variations will be displayed in the central glyph area when the user clicks on the highlighted phoneme. Whenever a phoneme becomes active its relevant information is displayed in the g-number and p-value areas, its glyph image is repeated in the lower right hand corner. *See figures 10 through 14 on the next page.*

The glyph module takes another approach. The central interface here consists of an array of the forty glyph images, five rows by eight columns. Although not readily apparent, the sequence of images is actually in alphabetical order, reading left-right/top-bottom, conforming to the hierarchy of western visible language. As the user rolls the cursor over the glyph images each one is brightly highlighted, indicating its selection. This type of display utilizes Tufte's "small multiples" principle. It enables the user to make a rapid visual comparison of the glyph forms. When selected, its relevant data is displayed in the fields at the bottom of the screen.

figure 10

figure 11

The number module functions similarly to the glyph module. The user is presented with an array of forty g-numbers (graphical) that correspond to each glyph. As the user rolls the cursor over a number, that number highlights and all the relevant information for that glyph is displayed below in the information display areas.

figure 12

figure 13

Much thought went into the stylistic execution of the screen designs. Originally the idea was to create an effect that emulated a sort of antiquated paper texture. All of the informational graphics (glyphs, phonemes, numbers) were to be rendered in a flat color technique that looked hand painted, somewhat similar to the hand drawn Mayan codices. After a few unsuccessful attempts, it became apparent that this idea was not going to work. For some reason the images that were created in this manner were just not satisfactory. They did not establish the experience or mood desired.

figure 14

Another idea was to create an entire interface with elements that appeared to be made out of stone. This design was to be less dependent

on the blatant use of color, its direction was to focus more on the communicative aspects of rich texture, light quality and atmosphere. To be most effective, the stone imagery would have to seem as if it had been fashioned by ancient Mayan artisans. The interface would be embellished lavishly with traditional motifs and mythic imagery. All of these elements were essential to produce a feeling of discovery, as if the user had stumbled upon some ancient ruins swallowed by the rainforest. Even the navigational controls and display areas would have to manifest these qualities. After building a preliminary screen it was obvious that this was the way to go . *See figure 15.*

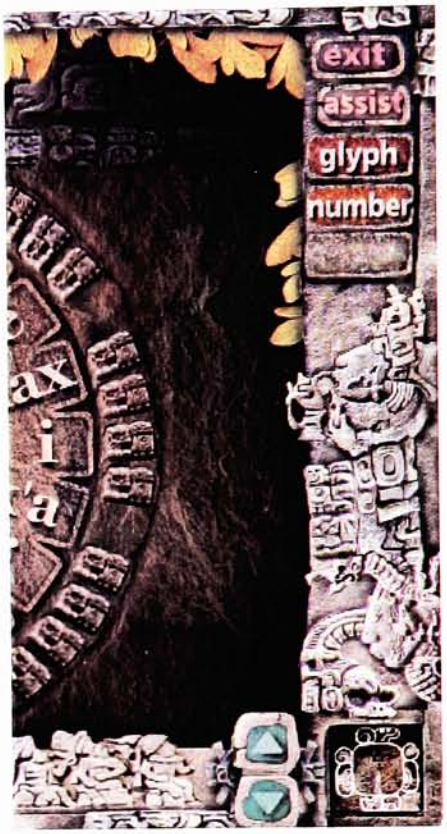

figure 15

The final images for production were generated by a variety of techniques. All the base stone textures were scanned from photographs of Mayan artifacts. Several texture bases were created by randomly replicating a single scanned element a number of times across an entire screen. Once the bases were created the next step was to isolate the various motifs and glyphs that would border the central image. Low and medium relief artifacts were scanned at a relatively high resolution. This enabled the extremely small and detailed motifs to be extracted from the source image. The motifs typically extracted were only a minor element of the original image. These minor elements would then become units to be reordered and replicated to form larger units.

Once extracted from the source image, the motifs were then color corrected and tonally balanced to match the base texture they were to be applied to. Often the textural quality of the base had to be manifested into the motif elements directly if the variation was too obvious. After the larger motif units were assembled according to the underlying screen design more corrections had to be made. Due to the fact that the composited

motifs and base textures came from many different sources which had been lighted and photographed under different circumstances, every minute detail had to be meticulously retouched by hand to create a uniform sense of lighting. Some motifs had been rendered in slightly higher relief than others and to maintain visual continuity, it was necessary to paint in greater depth. Much of the image editing here was at the pixel and sub-pixel level.

Once the final screens were composed and all the fine detail tweaks were made the next step was to create all the large scale lighting effects. These were accomplished by using a series of layered shadow masks over the entire screen. The first masks to be generated were entirely radial, even gradients. By themselves their effect is too artificial and mechanical, so the next layers are hand painted by a series of brushes that decrease in intensity as they decrease in size. As the brushes get smaller and less intense, greater attention is paid to accentuating the smaller details of the screen. The effect achieved is one of greater subtlety at greater detail (very effective for "micro-readings").

With everything in place and lighting established the next step was to proceed with the creation of any collateral graphics. These included the graphics representing button states, animated sequences and roll-over states. It was extremely important that all of the collateral graphics mesh seamlessly with the original static screens. They had to reflect the overall lighting and textural qualities established. In the case of the animated sequences the original final screen design was cropped to the exact area in which the animation would take place. This cropped file still maintained all the layering information involving all the lighting effects and textural

The sequence displayed below illustrates the process of layering, compositing and integrating the wide variety of images used to create some of the environmental effects.

details. Depending on the sequence, either new graphics were introduced into layers to be animated or pre-existing layers were broken apart and prepared for animation. When the sequences had been animated, rendered into separate frames and superimposed onto the final screen design, the effect was seamless. This cropping technique was used in much the same way to create the other collateral artwork as well to equal success. The key to maintaining visual continuity is to work directly from the final artwork after all the iterations have been made.

figure 16

Working with this style proved to have many advantageous effects. One effect that emerged as the art was created was an excellent sense of space, volume and location. Much of this was due to the interaction of light and shadow within the screen which created a layered effect of visual differentiation between the outer interface of navigational control/info display and what was happening in the main interaction area. The result was the generation of interface "levels," one level of interaction and another above it. *See figure 16.* The upper level of interaction would always stay the same for the user, consistently familiar. The level below (it may be more appropriate to say inside) was subject to change.

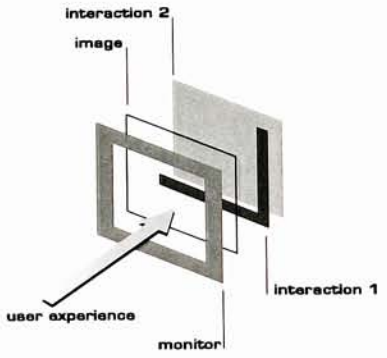

figure 17

The idea of layers becomes increasing important to enriching the user's experience. Conceptually the presence of these layers of Interactivity can be extended outward to include the frame of the monitor. At the highest level the user views the monitor to experience the monitor as only a monitor, within that is an image or screen. At the image level the concept of "monitor" has been abandoned and the user focuses on the experience of the image. With Interactivity introduced at the level of "image" the user abandons the experience of image to explore the interaction framed within. In the case of this project this interaction eventually allows the

user to dive down even further by driving interaction at an even lower level in the main interaction area. What you have created is a vortex of experience that not only enhances communication but also impacts the user in a positive way.

Implementation and Experience: This stage of production is concerned with the realization of all the information accumulated in all the previous stages.

It became obvious in the final implementation that it would be necessary to provide some kind of context or introduction for the entire project. This was accomplished in the creation of a linear introductory node that would be activated on start-up. The first screen that the user views appears to be a wall of some kind of Mayan temple within the murky confines of a South American rainforest. When this appears a quiet tribal rhythm begins to play in the background. The focus of the screen is a relief figure of a mayan ball player rendered in low relief, bordered on the top by a series of composite glyphs and along the bottom by pattern of seated figures and Mayan motifs. *See figure 18.*

This screen remains static for a few minutes, then the inner area cracks through the center and is pulled apart in an earth-shaking rumble. As the two pieces move apart outward beyond the edges of the screen a new area is revealed below. Slowly illuminated as the pieces move apart we are able to read the typography "A Catalogue of Mayan Glyphs." A sub-title animates up from infinity to say that this is " a study in information design. This dissolves to a screen that provides a brief introduction to what this project is concerned with. At this point the user is presented with some limited interaction that allows them to access additional infor-

figure 18

The large scale animation activated on startup was created by cycling through a sequence of frames encompassing the entire area of motion. The sequence involved the animation of several subtle shadow layers and overall luminance as well as key-framed positions of the wall pieces. The animated type that is revealed below that layer is small quicktime movie superimposed on the background layer.

mation or to immediately start the application.

Once the user starts the application, their current screen dissolves to reveal the main phonetic interface surrounded by the consistent navigational and informational interface. The two fields that display the p-values and g-number animate up to their final positions on the screen. Within the center of the phonetic interface is a large jade disk inscribed with the image of a Mayan warrior that splits down the middle rotating out of view in an underlying level. This animation reveals the area in which the large glyph images will be displayed when activated by the user. The user can identify that the p-value module is active by viewing the navigational controls. When a module has been activated its navigation button becomes inactive, visually indicated by its lack of color and roll-over feedback. At the same time the "stone carved" typographic label fades in and out of view. To use this interface the user only needs to position the cursor over one of the phonemes in the circle. While the active phoneme is flashing , its corresponding image appears in the center of the screen.

The user can choose to interact with the navigation controls or the exit and assist functions at any time. These buttons all display similar visual behavior and have a similar audible feedback. For example, if they wanted to navigate to the glyph module they would roll the cursor over the glyph button and click. The glyph button will automatically highlight when the cursor is over it. When the user clicks on it, the button appears to be depressed and a "chunk" sound is heard. When this action occurs the phonetic interface portion of the screen dissolves to reveal the glyph interface. The exit and assist buttons have highlighted and depressed states too, and when depressed they emit a "klook!". These two buttons function as toggles to view or hide the additional functions that they entail. If the

It is important to note that one of the underlying concepts being reinforced by the use of animation are the ideas of revelation and discovery. Most of the motion of the screen involves the removal of an obscuring layer to view the important information that lies beneath it. This theme is manifested repeatedly throughout the project in a variety of forms. This effect also works to draw the user deeper into the screen experience, working to enhance communication, as discussed earlier.

All the audible feedback involved with the interface reflects and reinforces all of the visual relationships presented on the screen. If a grouping of buttons look and behave similarly, then logically they should have similar audible qualities. The "klook!" of the exit and assist button suit their visual character. The only difference is that the "klook!" of the exit button is a half step higher that the assist button to reflect its position on the screen. The navigational controls all emit the same "chunk" sound because they are all of equal importance and their visual hierarchy on the screen is arbitrary.

functions "credits" or "help" are initiated the menus are automatically "put away." If both menus are active and the "credits" or "help" button is initiated the uninitiated menu is put away first, followed by the menu where the button was clicked. Using the sound control will not put away the assist menu. Its unique behavior and characteristics require that it be available until the user has found the desirable sound level, which may take a few tries.

The small buttons of the assist and exit menus all emit the same diminutive "pleep" for the same reasons. The sounds emitted by the jade button at the bottom of the screen ('klunk") vary only in the tonal difference that reflects their function and position. All of these sounds have been chosen and edited specifically to reflect the overall quality of the interface.

The user also has the choice of viewing the numerically adjacent glyphs by using the two "jade" buttons on the bottom of the screen. These buttons don't have a highlighted state. In this case it is unnecessary to visually alert the user because the function is completely benign, and they do not significantly alter the experience of the screen. There is visual and audible feedback when the button is depressed. As the user sees the button switched to its depressed state they hear a harmonious "klunk". No matter how the user interacts with the screen the corresponding information for a particular glyph appears in the same two fields at the bottom of the screen and there is always one redundant display (the redundancy mirrors which module is active). If the user does choose to navigate to the glyph module then the phonetic interface portion of the screen dissolves away and the user sees an array of stone blocks. Each block has been carved in relief to show the image of a single glyph. In this final implementation the user can access the glyph information by positioning the cursor over the desired glyph to display its information in the p-value and g-number fields.

When the user navigates to a new module they should be entirely unaware of the underlying shift in architecture that takes place. For, example, when navigating from one module to another module (via the button) the application is actually loading a separate file containing all the information and code that drives that module, it is a separate information space. When the user makes their navigational choice the only indication of the conceptual shift is the visual dissolve between the two main interfaces. It is important that the user maintains their conceptual point of view. If they don't have to reorient themselves to an entirely new experience they can focus their attention towards absorbing more information.

As before, when the user navigates to the number module, the previous module's interface dissolves to the numeric interface. This interface is composed of an array of forty g-numbers that appear to chiseled out of the background stone. When the user highlights a specific number its glyph appears in the lower right-hand display area.

conclusion

The base objective of this project was to address the problem of information design as it is applied to interactive multimedia. The context for this study in information design was the creation of an interactive guide to Mayan hieroglyphs. Two important factors emerged from this context. The first factor was the need to present these glyphs in an easily navigable, non-linear structure as resolved from the failures of Eric Thompson's work and the exploration of the information structures at The Mayan Epigraphic Database Project. The second factor was the need to create an enhanced user experience that would communicate the breath and depth of the Ancient Mayan culture.

The research into information design revealed the importance of design on many levels. In the case of interactive media these levels are manifested in the arrangement of information structures, interactivity within those structures and how that interactivity presents itself to the end user. A production model derived from Clement Mok's DADI process was used to methodically address design and initiate production through all of these levels.

A Catalogue of Mayan Glyphs successfully executes the application of information design within an interactive format. The catalogue creates an information space that is easily navigable. A set of simple controls and

consistently displayed information make this possible. A modular approach used in both the architecture and design help to create a unified and consistent experience for the user. The visual treatment of the catalogue is powerful and effective. The user is able to grasp the significance of the ancient Mayan culture in the history of human civilization through the beauty and complexity of their written language and artifacts.

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http://jefferson.village.virginia.edu/med/glyph_catalog.html
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appendix A

a list of all known glyphs organized by g-number

source: http://jefferson.village.virginia.edu/med/catalog.txt (The Mayan Epigraphic Database Project)

0001.00 , u
0001.01 , u
0002.00 , u
0003.00 , u
0003.01 , u
0004.00 , na
0005.00 , UND
0006.00 , u
0007.00 , u
0008.00 , u
0009.00 , UND
0010.00 , u
0011.00 , u
0012.00 , ah
0012.01 , ah
0013.00 , u
0013.01 , u
0013.02 , u
0014.00 , k'ul
0015.00 , a
0015.01 , a
0016.00 , yax
0016.01 , yax
0016.02 , yax
0017.00 , yi
0017.01 , yi
0017.02 , yi
0018.00 , hi
0019.00 , mu
0019.01 , mu
0020.00 , UND
0021.00 , bu
0021.01 , bu
0022.00 , UND
0023.00 , na
0024.00 , li'
0025.00 , ka
0025.01 , ka
0026.00 , katun
0027.00 , ka
0028.00 , UND
0028.01 , UND
0029.00 , UND
0030.00 , UND
0031.00 , UND
0032.00 , hu
0032.01 , hu
0033.00 , hu
0034.00 , hu
0035.00 , k'ul
0035.00 , k'u
0035.01 , k'ul
0035.01 , k'u
0035.02 , UND
0036.00 , k'ul
0036.01 , k'ul
0037.00 , k'ul
0038.00 , k'ul
0039.00 , k'ul
0040.00 , k'ul
0041.00 , k'ul
0041.01 , k'ul
0041.02 , k'ul
0042.00 , UND
0042.01 , UND
0042.02 , UND
0043.00 , mol
0044.00 , to
0044.01 , to
0044.02 , to
0045.00 , hu
0045.01 , hu
0046.00 , hu
0047.00 , ya
0048.00 , na
0049.00 , to
0050.00 , UND
0051.00 , ta
0052.00 , UND
0053.00 , ta
0053.01 , ta
0054.00 , ta
0055.00 , ic-il
0056.00 , le
0056.01 , UND
0057.00 , si
0057.01 , si
0057.02 , si-i
0057.02 , si
0058.00 , sak
0058.01 , sak
0059.00 , ti
0059.00 , ta
0059.00 , te
0059.01 , ti
0059.01 , ta
0059.01 , te
0060.00 , nu
0060.01 , hun
0060.02 , hi
0061.00 , yu
0062.00 , yu
0063.00 , UND
0064.00 , UND
0064.01 , UND
0065.00 , UND
0066.00 , UND
0067.00 , wo
0067.01 , wo
0067.02 , wo
0068.00 , z'a
0068.01 , z'a
0069.00 , he
0070.00 , UND
0071.00 , ma
0072.00 , c'a
0073.00 , c'a
0074.00 , ma
0074.01 , ma
0075.00 , UND
0076.00 , c'a
0077.00 , c'a
0078.00 , te
0078.01 , te
0078.02 , te
0079.00 , pat
0080.00 , pat
0080.01 , pat
0081.00 , te
0082.00 , li
0082.01 , li
0083.00 , li
0084.00 , nal
0084.01 , nal
0085.00 , nal
0086.00 , nal
0086.01 , nal
0087.00 , te
0087.01 , te
0088.00 , hi
0089.00 , tu
0089.01 , tu
0090.00 , tu
0091.00 , tu
0092.00 , tu
0092.01 , tu
0093.00 , c'a
0094.00 , UND
0095.00 , ik'
0095.00 , ek'
0095.01 , lo
0096.00 , ta
0097.00 , UND
0098.00 , nu
0099.00 , UND
0100.00 , UND
0100.01 , ki
0101.00 , k'ul
0101.01 , k'ul
0102.00 , ki
0103.00 , ta
0103.01 , ta
0103.02 , ta
0104.00 , UND
0105.00 , u
0106.00 , nu
0107.00 , UND
0108.00 , ca
0109.00 , cak
0109.01 , cak
0109.02 , cak
0110.00 , ko
0110.01 , ko
0111.00 , bak
0112.00 , UND
0113.00 , ta
0114.00 , xa
0115.00 , yo
0116.00 , ni
0116.01 , ni
0117.00 , wi
0118.00 , wi
0119.00 , UND
0120.00 , ne
0121.00 , zuk
0121.00 , zu
0121.00 , ah
0122.00 , k'ak
0123.00 , UND
0124.00 , zo
0125.00 , ya
0125.01 , ya
0126.00 , ya
0126.01 , ya
0127.00 , c'a
0128.00 , k'ah
0128.01 , k'ah
0128.02 , UND
0129.00 , UND
0130.00 , wa
0130.01 , wa
0131.00 , wa
0132.00 , UND
0133.00 , ya
0134.00 , UND
0135.00 , ca
0135.01 , ca
0135.02 , zo
0136.00 , hi
0136.01 , hi
0137.00 , UND
0138.00 , to
0139.00 , la
0139.01 , la
0140.00 , la
0140.01 , la
0141.00 , ahaw
0142.00 , ma
0143.00 , UND
0144.00 , UND
0144.01 , UND
0145.00 , ce
0145.01 , ce
0146.00 , si
0147.00 , UND
0148.00 , UND
0149.00 , nu
0149.01 , UND
0150.00 , ak
0151.00 , nu
0151.01 , nu
0152.00 , iz
0152.01 , iz
0153.00 , hal
0153.00 , nal

0154.00 , UND
0155.00 , ol
0155.01 , ol
0155.02 , ol
0156.00 , ol
0157.00 , way
0157.01 , way
0158.00 , UND
0158.01 , UND
0159.00 , UND
0159.01 , UND
0160.00 , UND
0161.00 , UND
0161.01 , UND
0162.00 , UND
0162.01 , UND
0163.00 , mi
0164.00 , UND
0165.00 , UND
0165.01 , UND
0166.00 , hu
0167.00 , UND
0168.00 , ahaw
0168.01 , ahaw
0168.02 , UND
0169.00 , ahaw
0169.00 , ah_caan
0169.01 , ahaw
0169.01 , ah_caan
0170.00 , ahaw
0171.00 , hu
0172.00 , UND
0172.01 , UND
0173.00 , mi
0174.00 , kuc
0174.01 , kuc
0175.00 , til
0176.00 , UND
0176.01 , UND
0177.00 , pi
0178.00 , la
0178.01 , la
0179.00 , sak_nik
0180.00 , ha
0180.00 , a
0180.00 , ah
0181.00 , ha

0181.00 , a
0181.00 , ah
0182.00 , hoy
0183.00 , lak
0184.00 , k'inic
0185.00 , UND
0186.00 , UND
0187.00 , k'aba'
0188.00 , le
0189.00 , zuk
0189.00 , zu
0189.00 , ah
0190.00 , c'ak
0191.00 , u
0192.00 , otoc
0193.00 , k'al
0194.00 , UND
0195.00 , UND
0196.00 , ye
0197.00 , UND
0198.00 , UND
0199.00 , UND
0200.00 , pi
0200.01 , pi
0201.00 , po
0202.00 , pa
0203.00 , z'u
0204.00 , u
0205.00 , u
0205.01 , u
0206.00 , UND
0207.00 , oc
0207.01 , oc
0208.00 , UND
0209.00 , UND
0210.00 , UND
0211.00 , u
0212.00 , k'ix
0212.01 , k'ix
0213.00 , lakam
0213.01 , lakam
0214.00 , UND
0215.00 , UND
0216.00 , su
0217.00 , UND
0218.00 , hom
0218.00 , lah

0218.01 , hom
0218.01 , lah
0218.02 , ca
0219.00 , ci
0220.00 , UND
0220.01 , UND
0220.02 , ye
0220.03 , k'u
0220.02 , UND
0221.00 , ca
0221.01 , k'inic
0221.02 , UND
0221.03 , UND
0222.00 , UND
0222.01 , UND
0223.00 , hu
0224.00 , UND
0225.00 , na
0226.00 , wa
0227.00 , wa
0227.01 , wa
0228.00 , a
0229.00 , a
0229.01 , a
0230.00 , UND
0231.00 , u
0232.00 , u
0232.01 , u
0233.00 , UND
0233.01 , UND
0234.00 , UND
0235.00 , UND
0236.00 , c'a
0236.00 , yaxun
0236.01 , c'a
0236.01 , yaxun
0236.02 , c'a
0236.02 , yaxun
0237.00 , i
0237.01 , i
0238.00 , a
0239.00 , UND
0240.00 , UND
0240.01 , UND
0241.00 , UND
0241.01 , wi
241.02 , UND

0242.00 , UND
0243.00 , UND
0244.00 , UND
0245.00 , malah
0245.01 , malah
0246.00 , hi-i
0247.00 , UND
0248.00 , z'i
0249.00 , UND
0250.00 , UND
0251.00 , ba
0251.01 , ba
0252.00 , UND
0253.00 , UND
0254.00 , la
0254.01 , UND
0255.00 , UND
0256.00 , UND
0257.00 , tuk'
0258.00 , UND
0259.00 , UND
0260.00 , UND
0261.00 , UND
0262.00 , UND
0263.00 , UND
0264.00 , nu
0265.00 , UND
0266.00 , pu
0266.01 , pu
0267.00 , UND
0267.01 , UND
0268.00 , UND
0268.01 , UND
0269.00 , UND
0270.00 , UND
0271.00 , UND
0272.00 , UND
0273.00 , UND
0274.00 , UND
0275.00 , UND
0276.00 , li
0277.00 , UND
0278.00 , sa
0279.00 , o
0279.01 , o
0279.02 , o
0280.00 , o

0281.00 , k'an
0282.00 , nu
0283.00 , si
0283.00 , sih
0284.00 , UND
0285.00 , UND
0286.00 , ta
0286.01 , ta
0287.00 , c'o
0287.01 , c'o
0288.00 , UND
0289.00 , UND
0290.00 , UND
0291.00 , UND
0292.00 , UND
0293.00 , UND
0294.00 , may
0295.00 , UND
0296.00 , o
0297.00 , UND
0298.00 , UND
0299.00 , zo
0300.00 , UND
0301.00 , bi
0301.00 , be
0302.00 , lala
0302.00 , lal
0303.00 , UND
0304.00 , UND
0305.00 , UND
0306.00 , UND
0307.00 , UND
0308.00 , UND
0308.01 , li
0309.00 , UND
0310.00 , UND
0311.00 , UND
0312.00 , UND
0313.00 , UND
0314.00 , al
0314.01 , al
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